Performance Pay, Sorting and Social Motivation

Tor Eriksson, Marie Claire Villeval

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Abstract

Variable pay links pay and performance but may also help firms in attracting more productive employees. Our experiment investigates the impact of performance pay on both incentives and sorting and analyzes the influence of repeated interactions between firms and employees on these effects. We show that (*i*) the opportunity to switch from a fixed wage to variable pay scheme increases the average effort level and its variance; (*ii*) high skill employees concentrate under the variable pay scheme; (*iii*) however, in repeated interactions, efficiency wages reduce the attraction of performance pay. Social motivation and reputation influence both the provision of incentives and their sorting effect.

JEL Codes: M52, J33, J31, C91

Keywords: Performance pay, incentives, sorting, social motivation, experiment

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I. INTRODUCTION

In the last two decades the prevalence of different forms of variable pay has increased substantially in many firms and countries. Variable pay schemes are typically motivated by the incentive effect they exert on the employees by linking pay to performance. It is, however, frequently forgotten that performance related pay may also help firms in attracting the most productive employees and in weeding out the less productive ones. In contrast, fixed pay schemes have not only less incentive power but they are also less able to sort employees since they are usually implemented when it is difficult and costly to measure individual performance. If this self-sorting effect is not accounted for, the higher efficiency observed when comparing a piece-rate compensation scheme relative to an hourly wage scheme may be unduly attributed to the incentive effect of the variable wage; see Lazear (2005). The sorting effect arises for two reasons. Highly productive employees will prefer performance pay to hourly or monthly pay in as much as they know that their productivity is higher than that of the other employees in the firm. Thus, performance pay enables them to increase their income from work, whereas the less productive employees will tend to quit or avoid joining firms that use performance pay schemes, because they are not attractive to them.

A first aim of this paper is to report the results of a laboratory experiment designed to investigate the incentive and the sorting effects of performance-pay, by studying how the employees self-select their incentive scheme and choose their level of effort. This is motivated by the fact that due to dearth of natural data, the distinction between the selection and incentive effects of pay schemes cannot be easily documented empirically. As regards

the incentive effect of performance pay, one strand of the literature emphasizes the repetitive game nature of employment contracts (see Malcomson, 1999 for a survey), labor market conditions (MacLeod and Parent, 1999), or competition in the product market (Bertrand, 2004). So far, only a few studies have tried to identify a sorting effect of performance pay distinct from its incentive effect.[1] The best way to isolate the two effects is to use personnel files of firms that have changed their compensation schemes. This has been done in a widely cited econometric case-study of the Safelite Company by Lazear (2000, 2005). Barro and Beaulieu (2003) study a large hospital company that switched from a salary to a profit-sharing plan compensation and they also find increases in output as well as selection effects. However, following the strategy in Lazear (2000) is in most cases difficult as the switch from one compensation scheme to another can only rarely be considered as exogenous and finding good instruments for the choice of compensation scheme is extremely difficult. An additional problem is finding data on individual performance under both fixed wage and variable wage schemes.[2] Experimental methods may help in circumventing some of these difficulties by guaranteeing the exogeneity of the introduction of performance-pay. The relationship between risk attitude and sorting has been recently documented by means of field experiments (Bellemare and Shearer, 2006) and laboratory experiments in which employees can choose between various payment schemes (Dohmen and Falk, 2006; Cadsby et al., 2007; Eriksson et al., 2007).

[1] Most studies of the consequences of changes in reward systems focus exclusively on incentive effects; see Freeman and Kleiner (2005), Paarsch and Shearer (1999), and Nagin et al. (2002).
[2] Parent (1997) shows, from individual data, that piece-rate pay is associated with an incentive effect, whereas bonuses are more related to a sorting effect. A limitation is however that the data do not inform about the proportion of the wage that is variable. Booth and Frank (1999) make use of panel data on individuals to control for both observable worker characteristics and unobservable heterogeneity but no direct measure of productivity is available.

The laboratory experiment presented in this paper has been designed to test the key predictions derived from Lazear's (2000) model, in a framework in which effort is observable but not contractible and in which the risk attitude of employees cannot play any role. The observability of effort would of course influence the offer of the payment scheme by the employers, but here we are interested in the selection made by the employees. The predictions are the following: (*i*) a switch from a fixed to a variable wage increases the average level of effort, (*ii*) introducing the possibility for the employees to move to a variable wage scheme increases the variance in effort, (*iii*) the gain in productivity is due to both an incentive effect and a sorting effect, and *(iv)* the possibility to choose between a fixed wage and a variable pay leads to a segmentation of the labor market with high skill employees concentrated in the performance-pay firms and low skill employees populating the fixed-pay firms. Our experimental methodology provides an opportunity to observe the incentive and sorting effects when both a fixed wage and a variable reward system are available to the employees. It both allows us to control the environment (skill levels, structure of pay) and provides unbiased measures of the agents' productivity and mobility.

This experiment also accounts for the observation that employment relationships usually are long-term relationships. Repeated interactions frequently involve social motivation that could influence both the incentive and the sorting effects of pay schemes. In repeated games where reputation building may occur, the interaction of reciprocally motivated subjects and selfish subjects may lead to the enforcement of labor contracts even in the absence of a formal incentive system (Falk *et al.*, 1999; Fehr *et al.*, 1997). In such a context, the introduction of explicit (positive or negative) incentives may even crowd out

voluntary cooperation (Frey and Oberholzer-Gee, 1997; Gneezy and Rustichini, 2000; Houser *et al.*, 2007; Dickinson and Villeval, 2004). Therefore, we test the additional hypothesis that (*v*) when interactions are repeated, the difference between the fixed and the variable pay schemes in terms of incentive provision and sorting is weakened. Indeed, a generous (non-equilibrium) fixed wage might be able to attract also skilled employees and reciprocity might motivate them to work hard.

Our experiment involves firms and workers with two possible skill levels who have an opportunity to contract and work under different pay schemes. It consists of two treatments, a "fixed wage" treatment and a "menu" treatment. Two conditions have been implemented, a "market" condition and a "partner matching" condition, which are intended to represent a spot labor market and a long-term employment relationship respectively. Under the market condition, we implement a fixed wage treatment in the first part of the sessions. Each firm posts its fixed wage offer. Each worker then successively chooses an offer and decides on her actual level of effort. In the second part of the sessions, we implement the menu treatment in which the firm offers both a fixed pay and a variable pay scheme in which the wage increases in the ex post level of effort. Under the partner matching condition, the only difference is that pairs are fixed throughout the session.

Our findings support the hypotheses mentioned above. Under the market condition, when a variable pay scheme becomes available, the average effort as well as its variance increase substantially compared to the situation where a fixed wage is imposed. The increase arises mainly because the high skill employees select the variable pay scheme as they can improve their payoff by exerting a higher effort. As a consequence, the labor market

becomes segmented with the low skill employees remaining in fixed pay firms and most high skill employees working under a variable pay scheme and putting forth high effort. In the repeated interaction game, however, and relative to the market condition, most firms offer higher fixed wages, workers exert a higher average effort under the fixed pay scheme and the high skill employees are less inclined to switch to a variable pay scheme. Thus, repeated interactions affect contractual choices and alter the sorting effect of performance pay. This suggests that efficiency wages may be a reason for why firms do not adopt variable pay schemes.

The remainder of the paper is organized as follows. Section 2 outlines the experimental design and procedures. The empirical results are presented in Section 3. Section 4 summarizes and concludes.

II. EXPERIMENTAL DESIGN

After a presentation of the experimental protocol, we will derive the theoretical predictions. Thereafter, the experimental procedure will be developed.

Protocol

The experiment involves firms and employees in equal number. The employees are either low skill type or high skill type with the same probability and this distribution is common knowledge. These two types of employees differ with respect to their convex cost functions: for performing the same level of effort, the low skill employee has to bear a higher cost than the high skill employee. Table 1 displays the cost associated with each level of effort by skill.

(Insert Table 1 about here)

Each session consists of two parts corresponding to two different treatments, the so-called Fixed Wage treatment and Menu treatment. Each part consists of 8 trading periods. All the participants have been subjected to both treatments. The experiment has been conducted under two conditions: a (posted bid) market condition and a partner matching condition.

Consider first the market condition and the Fixed Wage treatment. Each period includes two stages. In the first stage, each firm posts an incomplete labor contract on the market. The firm chooses both the amount of the fixed wage, w, and a non-binding desired level of effort, e. In contrast with the standard gift-exchange game, we use here a "mini-game" with fewer values of wages and effort. The wage can take four possible values, $w \in (20, 25, 35, 45)$; the desired effort level is among the values (0.2, 0.4, 0.6, 0.8 and 1). This design is motivated by the willingness to keep the same values across treatments while allowing for diverging utilities of the variable pay scheme according to the employees' skills in the second part (see below). This would not have been possible with a set of wages securing a strictly monotonic wage-effort profile. Each employee is allowed to accept any offer whatever her skill level; thus, in this treatment the firm cannot screen the skilled employees by its offer. All the contractual offers are displayed simultaneously on every employee's screen. In contrast, a firm cannot see the offers made by the other firms since we are not interested in studying wage contagion effects. As in Fehr et al. (1996) a random mechanism determines the order in which each employee can choose among the remaining available contracts. An employee can choose only one contract and she can reject all offers.

In the second stage, the employee who has accepted a contract chooses her actual effort level from the set of feasible levels. Effort is observable but not contractible. The firm receives a feedback on the acceptance of its offer by an employee, the skill level of this employee and her choice of effort. Each participant is informed about her payoff in the current period. The payoffs for one period are calculated as follows:

- for the employee: $\pi^E = w - c(e) - 8$ (with 8 being a fixed cost) upon acceptance of a contract, and = 0 otherwise;

- for the firm: $\pi^F = (v - w)e$ upon acceptance of its offer, and = 0 otherwise, where v =100 denotes a redemption value, i.e. the gross profitability of each unit of effort chosen by the employee. This function is standard and guarantees that loss aversion plays no role.

The launching of a new period reopens the market. Contract offers are identified with new numbers, so that it is not possible to identify firms or employees later on. Thus, a firm can neither reward nor punish the past decision of a specific employee. This rules out reputation formation. Table 2 displays the net payoffs associated with each possible decision.

(Insert table 2 about here)

The second part of the session consists of the Menu treatment. Now, two pay schemes coexist. In the first stage of each period, the firm posts a menu of contracts to the market. The menu includes both an exogenously defined variable pay contract and a fixed pay contract. Unlike in Fehr and Schmidt (2000), where principals choose between an explicit contract and an implicit contract, in our experiment the choice between the fixed and the variable pay schemes is made by the employees. This design guarantees that the

participants will not face a shortage of any type of pay scheme. The variable pay contract states that the wage can take four possible values, $w \in (20, 25, 35, 45)$ and that the wage paid to the employee depends on the actual level of effort chosen by this employee in the second stage of the period, according to the following relationship:

$$w = Max\ (20, b(e)\text{-}M)$$

where the piece-rate b is fixed at 5 and the measurement cost M imposed to the employee is fixed at 5. This means that this wage is determined *ex post*, after the firm has observed the actual level of effort of its employee. For the sake of comparability of employees' choices, the variable pay scheme is hold constant across firms.[3] As in the first treatment the fixed pay contract is an incomplete contract, which specifies both a wage, $w \in (20, 25, 35, 45)$, and a desired level of effort. Next, each employee has to choose both one menu of contracts among all the remaining offers available in the market and either the fixed or the variable pay scheme. Once a matching has been made in the market, both offers from the firm disappear from the market. This is like in the adverse selection models: once a contract is selected by an agent, the whole menu is no longer available. Since the variable pay scheme is available in every firm, this does not affect the model's predictions.

In the second stage of each period, the employee decides on her actual effort level. The firm is informed about the acceptance of its offer, the type of its employee, and her choice of both pay scheme and actual effort level. Each participant is informed about her payoff in the current period. This design allows us to analyze the attraction of each pay scheme on

each type of employee and its impact on the effort levels. Table 3 displays the net payoffs associated with each level of effort in the variable pay scheme; the net payoffs in the fixed pay scheme are the same as those displayed in Table 2.

(*Insert table 3 about here*)

Half of the sessions have been run with the Fixed Wage treatment implemented in the first 8 periods and the Menu treatment in the subsequent 8 periods, and half in reversed order.

Consider now the partner matching condition. In contrast to the market condition, firms and employees are here matched at the beginning of the session to form pairs that remain intact throughout the session. The firm is informed from the start about the skill level of its employee. The treatments, the payoff functions and feedback information are the same as in the other condition. The partner matching condition was implemented in three sessions.

Theoretical predictions

Given the assumptions of rationality and selfishness, the predictions of the game are straightforward. In the market condition, in the Fixed Wage treatment, at the second stage, any employee should provide $e^*=e_{min}=0.2$ whatever her type and irrespective of the wage contracted upon. No employee has an incentive to choose a higher level of effort since her cost increases in the effort level and because she can be neither punished nor rewarded for her actual effort. The firm should, therefore, offer a contract with the minimum wage ($w^*=20$ and $b=0.2$) in the first stage. Any employee should accept this offer whatever her type since a rejection can provide no better alternative. This prediction would not change if

[3]Allowing firms to set b would lead to a substantially more complicated protocol without corresponding gains of insight, since we are chiefly interested in the employees' choices.

the firm was informed in advance about the type of the employee it contracted with. The firm's payoff, given by $(v-w)*e$, is 16, while the high and low skill employees earn 11 ($w_{min}-c(e_{min})-8$) and 10, respectively.

Should the employees opt for a variable pay scheme in the Menu treatment? Let us consider the high skill employee first. Provided she performs the maximum effort level, choosing the variable pay enables her to receive a high wage (45), and to reach her highest utility (25). She is better off than if she had chosen the fixed pay scheme that makes her earn 11 in equilibrium in exchange for a wage of 20 and the minimum effort level. The variable pay scheme should thus attract the high skill employees, who are able to increase their payoffs by choosing the maximum effort. In contrast, the low skill employee should provide the minimum effort under both schemes as she earns 10 irrespective of which pay scheme is chosen and should thus be indifferent between the two. As a consequence, the firm should offer a menu of contracts with both the variable pay scheme and a fixed pay scheme with $w^*=20$ and $\bar{e}=0.2$. This menu is imperfectly separating since due to the minimum wage guarantee, the low skill employee is indifferent between the two schemes. The firm is better off in the Menu treatment than in the Fixed Wage treatment, because it can attract a high skill employee who should opt for the variable pay scheme and choose the maximum effort. In the latter case, its payoff amounts to $(v-b(e)+M)*e=55$.[4]

In the partner matching condition, since the game is repeated finitely, predictions regarding the decisions of both the firm and the employees are similar. If all participants have purely

[4] If it recruits a low skill employee, the firm's payoff is only 16 whatever the mode of payment chosen. Since the firm does not know which type of employee accepts its offer in the market condition, its expected payoff is 35.5 in the Menu treatment, compared with the certain payoff of 16 in the Fixed Wage treatment.

selfish preferences, we should, when moving from the Fixed Wage treatment to the Menu treatment, observe: *(a)* an increase in the average effort, *(b)* an increase in the variance of effort, *(c)* and a sorting of the employees according to their type, with the high skill employees concentrated in the variable pay scheme and the low skill employees in the fixed pay scheme due to the offer of a separating menu of contracts.

However, we know from many experimental studies (Fehr *et al.*, 1996, 1997) that individual behavior may be shaped by social motivation such as fairness, reciprocity and inequality aversion. We now turn to consider what would happen if the firm is fair and expects the employees to be reciprocal in the market condition. In the Fixed Wage treatment, such a firm may offer w=45 and ask for $\tilde{e} = 0.6$. If the employee indeed is willing to reward the intention of the firm, especially if wage comparisons matter (Clark, Masclet and Villeval, 2006), she chooses an effort equal to the desired one, the firm would earn 33, a high skill employee 32 and a low skill employee 25. All players should be better off with this fairness strategy relative to the equilibrium based on selfish assumptions. This strategy is not very risky for the firm since it increases its expected profit more in case the agents are reciprocal (it earns 33 instead of 16) than it decreases it if they turn out to be selfish and choose the minimum effort (it earns 11 instead of 16).

In the Menu treatment, a fair and inequality averse firm should offer the same fixed pay scheme as in the Fixed Wage treatment, with w=45 and $\tilde{e} = 0.6$. This menu of contracts is no longer separating. Its expected payoff is still 33 if the employee is reciprocal and inequality averse whatever her skill level. Indeed, such employee should choose the fixed pay scheme that both increases her payoff (25 instead of 10 for a low skill and 32 instead of

25 for a high skill) and reduce the difference in payoffs relative to the firm as compared with the variable pay scheme. Therefore, in the presence of social preferences, the existence of an alternative performance pay should not affect the choice of the fixed wage offer. This strategy is however not only costly to the firm, but also risky. Indeed, if a selfish employee picks this offer, she will opt for the fixed pay scheme and make the minimum effort leaving the firm with a payoff of 11. Had the firm offered a fixed wage of 20, the high skill employee would have been better off by opting for the variable pay and choosing the maximum effort, thus guaranteeing the firm a 55 payoff.

Consequently, accounting for social motivation, we should, when moving to a Menu treatment, observe *(a')* a smaller increase in the average effort than under the assumption of selfishness, and *(b')* less sorting of the employees, more of both types being concentrated in the fixed pay scheme. In the partner matching condition, the same predictions can be made. The fair strategy is, however, less risky than in the market condition since the firm can punish an employee who behaves selfishly by lowering the wage in the subsequent periods, forcing the high skill employee to switch to the variable pay scheme.

Experimental procedures

The experiment consisted of 9 sessions, with 16 subjects per session. We implemented the market condition in six sessions and the partner condition in three sessions. This gives a total of 760 and 384 observations, respectively.[5] The sessions were conducted at the Groupe d'Analyse et de Théorie Economique (GATE), France. The 144 participants were

[5] Among these 760 observations, 384 have been collected in the Fixed Wage treatment and 376 in the Menu treatment. Due to a technical breakdown, we lost the 8 observations from one period in the Menu treatment.

recruited from undergraduate courses in local Engineering and Business schools. The subjects were inexperienced in this particular type of experiment. The experiment was computerized using the REGATE program developed at GATE (Zeiliger, 2000).

Participants were randomly assigned to a specific computer terminal. Instructions for the first part of the experiment were distributed and read aloud by the experimenter (see Appendix). They were written in neutral language. Questions were answered privately by the experimenter and the participants had to answer questions about the computation of firms' and employees' payoffs. No communication was allowed. In each session, 8 participants were allocated the role of a firm, 4 the role of a low skill employee and 4 the role of a high skill employee, and this distribution was public information. Role assignments remained unchanged throughout the session. After the completion of the first part, the instructions for the second part were distributed and read aloud. The participants had to answer a new understanding questionnaire with no question allowed.

Each session lasted on average 90 minutes, including payment of participants in private in a separate room. All amounts were given in points, with conversion into Euros at a rate of 100 points = €4. Payment in cash consisted of the sum of payoffs during each period plus a €4 show-up fee. On average in the market condition, the firms earned €18, the low skill employees €14 and the high skill employees €16. In the partner condition, the respective earnings were €19, €15, and €18.

IV. EXPERIMENTAL RESULTS

Overall statistics

Table 4 summarizes the main results by condition and treatment.

(Insert Table 4 about here)

With selfish preferences, the model predicts that, after a switch from a fixed pay to a variable pay scheme *(i)* the average individual effort increases, and *(ii)* the variance of effort increases. Table 4 shows that the average individual effort is 0.28 under the Fixed Wage treatment and it rises to 0.47 under the Menu treatment (+ 67.86%). The difference is significant (Wilcoxon test, p=0.002). The non-parametric statistics have been made considering that in the partner matching condition, each of the 24 employer-employee pairs represents one independent observation, whereas in the market condition, each of the 6 sessions, with 16 subjects per session, gives one independent observation. The variance of individual effort is 0.03 under the Fixed Wage Treatment and it rises to 0.12 under the Menu Treatment.[6] The difference is marginally significant (Wilcoxon test, p=0.088). Figure 1 displays the evolution of the average effort over time by treatment and condition when the Fixed Wage treatment was implemented before the Menu treatment.

(Insert figure 1 about here)

Figure 1 shows that compared to a situation where all the firms pay a fixed wage (i.e., periods 1 to 8), the average individual effort is higher when the employees can choose between two payment schemes (i.e., periods 9 to 16). The figure for the sessions in which the Menu treatment is played first gives similar conclusions.

The model also predicts that (*iii)* the increases in the mean and the variance of effort can be related to both an incentive and a sorting effect, and that (*iv*) there is a concentration of high skill employees in the variable pay scheme and the low skill employees in the fixed pay scheme. Figure 2 displays the evolution of average individual effort by skill, treatment and conditions, for the sessions in which the Fixed Wage treatment was played first.

(Insert figure 2 about here)

Table 4 and Figure 2 confirm that decomposing the data by skill levels helps in understanding that the incentive property of a variable pay scheme cannot alone explain the observed increase in productivity. We have also run six random-effects Tobit regressions accounting for the left and right censoring of the data to examine the determinants of the level of effort under each pay scheme, in each treatment and each condition, accounting for all the sessions. The independent variables include the skill level, the rent offered by the firm, a time trend and the order of sessions. The estimates (available upon request) show that skill is a major determinant (at the 1% level) of the subjects' choice of effort when the variable pay scheme is selected, but not when the fixed wage is chosen or implemented. In each condition, the Mann-Whitney tests also show that there is no significant difference in the level of effort exerted by the high skill and the low skill employees when they are paid a fixed wage, despite the differences in their cost of effort. However, when the opportunity to choose the pay scheme is provided, due to a substantial increase in the productivity of the high skill employees, but not of the low skill employees, the difference in productivity

[6] The difference is also significant when we compare the variances for Fixed Wage (0.02) and Menu treatments (0.13) in the market condition (Wilcoxon test: $p=0.028$). Corresponding numbers for the partner condition are 0.04 and 0.09 but the difference is not significant ($p>0.10$).

by skill level increases dramatically (MW tests: p=0.004 in the market condition, and p= 0.017 in the partner condition).

The overall growth in productivity is due to the fact that considerably more high skill employees choose the variable pay than the low skill agents when this opportunity is available. In the market condition, only 14.36% of the low skill employees choose the variable pay scheme and they exert on average a low effort under both the variable pay scheme (0.29) and the fixed pay scheme (0.23); in contrast, 63.10% of the high skill employees choose the variable pay scheme (MW test, 1% significance, p=0.004) and they exert either the maximum level of effort when they are paid a variable wage (0.96) or a low level of effort when paid a fixed wage (0.27). These are clear indications of a sorting effect of variable pay.

These observations suggest that the model delivers good predictions. However, while 88.21% of effort choices are at the equilibrium in the market condition, 43.47% of the decisions are out of the equilibrium in the partner matching condition (significant difference, MW test: p=0.070).[7] With repeated interactions, the hypothesis is that there is a smaller increase in the average individual effort when employees switch from the fixed to the variable pay scheme, and there is less sorting of the employees across payment schemes. As predicted, in the market condition, average individual effort increases significantly from 0.24 in the Fixed Wage treatment to 0.47 in the Menu treatment (Wilcoxon test, p=0.028). In the partner matching condition, the increase is only from 0.36 to 0.47 and marginally significant (Wilcoxon test, p=0.057). In this condition, most high

skill employees exert the level of effort that gives them the maximum wage under the variable pay scheme (0.92 on average). However, only 36.67% of them opt for this pay scheme whereas 63.10% of the high skill employees make the same choice when interactions are not repeated. In a long-term interaction, there is less segmentation by the payment schemes in terms of skills.

In order to gain further understanding of these differences, we consider next the firms' offers and analyze the self-selection of the employees.

Self-selection

However, before studying the self-selection of employees, it is important to know whether firms make separating offers. The prediction is that the firms should always offer minimum fixed wages. Table 4 shows the distribution of fixed wage offers by treatment and condition. In accordance with the experimental literature (Gächter and Fehr, 2001), a relatively high proportion of the firms offer non-minimum fixed wages, in particular when the employment relationship is long-term. The relative frequency of the minimum wage offers increases slightly in the market condition (the partner condition) from 44.53% (23.96%) in the Fixed Wage treatment to 48.94% (30.21%) in the Menu treatment. These increases are not significant (Wilcoxon tests, $p>0.10$), however.

Firms pay efficiency wages to elicit a reciprocal effort response from the employee. Overall, the correlation of the fixed wage and the desired effort level is positive. Spearman rank correlation coefficients are $\rho = 0.49$ in the market condition, and $\rho = 0.40$ in the

[7] We acknowledge the limitation of this non-parametric test due to the different numbers of independent observations when comparing the market and the partner matching conditions (6 and 24, respectively).

partner matching condition which is significant (p=0.061). We have also estimated multinomial logit regressions with robust standard errors and clustering for individuals, for each condition (available upon request), and with the minimum wage as the reference. The results show that the impact of the treatment on the probability to offer non-minimum (i.e., non-separating) contracts is almost never significant. In the market condition, wage offers of 35 or 45 are positively linked with an increased suggested level of effort and their probability decreases over time; their likelihood is not increased by the experience of positive reciprocity in the previous period. The order of the sessions only marginally reduces the likelihood of wage offers equal to 35. In contrast, in the partner matching condition, the firm rewards the reciprocity expressed in the previous period by its employee by offering fixed wage of 35 or 45 with a higher probability. In accordance with Fehr and Schmidt (2000), firms appear to prefer informal reciprocal interactions (i.e. offering a higher fixed wage in the hope of reciprocity) rather than making separating offers.

To analyze how employees self-select in the Menu treatment, we estimate a random-effects probit model in which the dependent variable is the choice of the variable pay scheme (according to which the relationship between the effort and the wage level is the same across firms). The independent variables are the skill level, the rent offered by the firm, the rank of the employee's decision in the market condition, the order of treatments in the market condition, and a time trend. The results of these estimations are reported in Table 5.

(Insert Table 5 about here)

Table 5 shows that the subjects self-select into the different payment schemes in terms of skills. Interestingly, the selection process is attenuated by the generosity of the contractual

offer in both conditions, as captured by the rent offered. In the market condition, conditional on the rent offered, there is an additional effect of the decision rank: when an employee must choose after the others, she is more likely to opt for the variable pay scheme, probably because of a comparison effect. In this condition the choice of the variable pay decreases over time, whereas having an initial experience in the Fixed Wage treatment increases the likelihood of a switch to the variable pay in the Menu treatment.

This confirms the descriptive statistics. The proportion of employees choosing the variable pay scheme is diminishing in the offered rent intervals. When the offered rent is zero or negative, 46.85% of the employees choose this scheme, but when the offer is generous (rent exceeds15), almost 95% of the employees opt for the fixed pay scheme which allows them both to obtain a higher payoff and to share the rent more equally with the firm. The average rent offered is higher in the partner matching condition (14.31) than in the market condition (6.85) (MW test: p=0.013). This may explain why a smaller proportion of high skill employees choose the variable pay scheme in the partner condition.

Efficiency

If one measures efficiency as joint payoffs, we find that introducing performance pay increases overall efficiency by 43.11% in the market condition: as indicated in Table 4, average joint payoffs increase significantly from 33.54 in the Fixed Wage treatment to 48.00 in the Menu treatment (Wilcoxon test, p=0.028). Is this increase mainly due to the incentive effect generated by the introduction of the performance pay scheme or to its sorting effect? We approximate the incentive effect by allocating artificially half of each skill category to each payment scheme and by applying them the actual efficiency of each

type of match under each scheme. Under the admittedly somewhat crude assumption that the employees exogenously allocated to each scheme would behave similarly than those who have actually chosen these schemes, we obtain an average hypothetical efficiency of 45.07. In other words, if half of each skill category was allocated the fixed pay scheme and the other half the variable pay scheme, the average efficiency of this economy would increase by 11.53 points, due to a pure incentive effect. The actual value, determined also by the sorting effect, indicates an average efficiency of 48.00 in the Menu treatment. Allowing people to self-select increases the hypothetical value by 3.07 points, which represents one fourth of the incentive effect.

In the partner matching condition, the increase of the average efficiency after the switch to the Menu treatment is also significant but it is only 15.06%, with average joint payoffs increasing from 43.55 to 50.11 (Wilcoxon test, $p=0.045$). Applying the same procedure as before, we obtain a hypothetical efficiency of 48.94, suggesting that the incentive effect of performance pay increases average efficiency by 5.39 points. Accounting for the sorting effect via the actual voluntary distribution of employees across payment schemes increases this hypothetical efficiency by an additional 1.17 points, which represents one fifth of the incentive effect.

These values suggest several comments. First, switching to an environment that offers both fixed wage and performance pay raises efficiency. Second, even acknowledging for the limits of their tentative approximation, the incentive effect outweighs the sorting effect. Third, in a repeated interactions environment, both the incentive and the sorting effects are weakened. Relative to the market condition, the incentive effect of the switch to the Menu

treatment is lower here because firms offer higher fixed wages; therefore, variable pay is less attractive to the high skill employees (only 36.67% of the high skill employees choose it instead of 63.10% in the market condition). As a consequence, if the variable pay scheme generates by design comparable efficiency in both the market and the partner matching conditions (77.88 and 74.64 in a match with a high skill employee, respectively), its overall attraction power is weakened in such an environment.

The analysis of the earnings distribution helps in understanding why the introduction of performance pay is not sufficient to fully maximize joint payoffs. In particular, reciprocating to a generous fixed wage by a non-minimum effort instead of choosing the variable pay scheme makes the high skill employee better off than exerting the maximum effort under the variable pay scheme. It increases her payoff while allowing for a more equal rent sharing with the firm. In contrast, choosing a variable pay scheme substantially increases inequality. [8] An interpretation of these findings is that inequality aversion from the firm and from the employee may affect both the incentive and the sorting effects of the variable pay scheme and therefore the overall efficiency of the environment.

V. DISCUSSION AND CONCLUSION

Economic theory of performance pay schemes predicts that the switch from a fixed to a variable pay scheme should increase the average output per worker because of incentive

[8] When the fixed pay is chosen in the market (partner) condition, the observed average net payoffs are 15.99 for a low skill employee, 20.64 for a high skill employee and 17.36 for the firm (21.68, 25.05 and 23.63, resp.). There is no significant difference between these payoffs (Wilcoxon tests, $p>0.10$). Under the variable pay scheme, the respective average payoffs are 9.52, 24.09 and 47.65 in the market condition and the differences are significant ($p=0.028$ for each pair-wise comparison); they are 10.00, 23.09 and 39.94 in the partner condition (significant differences between the low and the high skill employees' payoffs, $p=0.017$, and between the principal and the low skill employees' payoffs, $p=0.016$).

effects. Moreover, if workers differ with respect to ability, the high skill employees should be more attracted by the performance pay than the low skill employees since it allows them to receive a higher wage by exerting more effort.

Our experimental evidence confirms the coexistence of the sorting and the incentive effects of payment schemes as in Lazear (2000). It shows that a switch from a homogenous environment to an environment in which both a fixed and a variable pay schemes coexist, entails an increase in both average effort and the variance of effort. Effort only increases for the high skill employees because the variable pay scheme induces them to work harder. The low skill employees are not attracted by the variable pay scheme when firms offer non-minimum fixed wages. This observation suggests that there is a limit on the adoption of performance-pay despite its incentive effect. This adoption increases team heterogeneity within firms, with a widening wage gap that may generate conflicts. Consequently, variable pay schemes are less likely implemented in firms promoting teamwork.

The comparison between our market and partner conditions shows that the employees who choose the variable pay scheme are not necessarily the most ambitious ones. Provided the rent offered is sufficiently high, in a repeated interaction, a non-negligible fraction of the high skill employees also opt for the fixed pay. This indicates that if a firm pays efficiency wages to attract reciprocal employees and to allow for less unequal payoffs, then the variable pay scheme becomes less attractive to the skilled employees relative to the fixed pay scheme. Thus the social motivation of the subjects influences not only the provision of incentives, but may also affect their incentive and sorting effects. Although our design does not leave much room for reciprocity due to the limited space of strategies, we

nevertheless observe a smaller ability-based segmentation of employees when firms make generous offers and a smaller productivity gap when employees accept these efficiency wages and try to build a reputation of reciprocity. Therefore, we would expect that a design allowing for a larger scope for reciprocity would weaken this ability-based segmentation even further. An avenue for further research would be to look for a sorting effect based on social preferences and to analyze how social preferences and ability interact in the sorting process. This could contribute to explaining why we observe less segmentation of labour markets according to ability than expected by theory. Our results already suggest that we would expect to observe less performance pay in long-term employment relationships. This, in turn, could imply that differences across countries with respect to the employment protection legislation may be accompanied by differences in the prevalence of performance pay schemes.

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Table 1. The costs of effort by type of agents

Effort	0.2	0.4	0.6	0.8	1
Cost for the low skill employee	2	6	12	20	30
Cost for the high skill employee	1	3	5	8	12

Table 2. Net payoffs in the Fixed Wage treatment

Role	*Wage*	*Actual effort level*				
		0.2	*0.4*	*0.6*	*0.8*	*1*
Low skill employee	*20*	10	6	0	- 8	- 18
High skill employee		11	9	7	4	0
Firm		16	32	48	64	80
Low skill employee	*25*	15	11	5	- 3	- 13
High skill employee		16	14	12	9	5
Firm		15	30	45	60	75
Low skill employee	*35*	25	21	15	7	- 3
High skill employee		26	24	22	19	15
Firm		13	26	39	52	65
Low skill employee	*45*	35	31	25	17	7
High skill employee		36	34	32	29	25
Firm		11	22	33	44	55

Table 3. Net payoffs in the variable pay scheme (Menu treatment)

Actual effort level	*0.2*	*0.4*	*0.6*	*0.8*	*1*
Associated wage	*20*	*20*	*25*	*35*	*45*
Low skill employee's payoff	10	6	5	7	7
High skill employee's payoff	11	9	12	19	25
Firm's payoff	16	32	45	52	55

Table 4. Summary statistics

Condition	All data		Market condition		Partner condition	
Treatment	Fixed wage	Menu	Fixed wage	Menu	Fixed wage	Menu
Fixed wage offer	28.10	27.71	22.16	25.66	31.98	31.72
Relative frequency of						
- offer of 20	37.67%	42.61%	44.53%	48.94%	23.96%	30.21%
- offer of 25	28.12%	26.58%	29.17%	28.72%	26.04%	22.40%
- offer of 35	18.58%	13.20%	18.75%	13.56%	18.28%	12.50%
- offer of 45	15.62%	17.61%	7.55%	8.78%	31.77%	34.90%
Desired effort	0.62	0.67	0.62	0.69	0.62	0.61
Nb rejected contracts	21	16	4	1	17	15
Nb accepted contracts	555	552	384	375	192	177
% choice variable pay						
- High skill	-	54.51	-	63.10	-	36.67
- Low skill	-	15.64	-	14.36	-	18.39
Mean effort	0.28	0.47	0.24	0.47	0.36	0.47
- High skill	0.28	0.67	0.24	0.71	0.37	0.60
- Low skill	0.28	0.27	0.24	0.24	0.36	0.34
Variance of effort	0.03	0.12	0.02	0.13	0.04	0.09
Payoff - High skill	18.55	23.31	16.98	22.82	21.88	24.33
- Low skill	16.23	16.48	14.98	15.06	19.01	19.53
Efficiency	36.70	48.68	33.54	48.00	43.55	50.11
– High skill match	38.02	62.20	34.46	63.71	45.57	59.06
– Low skill match	35.37	35.07	32.63	32.38	41.45	40.85

Note: Payoffs and efficiency are measured for the accepted offers only.

Table 5. The choice of the variable pay scheme

Dependent variable: Choice of the variable pay scheme	Random-effects probit model	
Conditions	Market	Partner
High skill employee	2.448*** (0.381)	1.233*** (0.459)
Offered rent	- 0.044*** (0.013)	- 0.113 *** (0.022)
Decision rank	0.129** (0.053)	_
Time trend	- 0.114*** (0.041)	0.059 (0.062)
Order of sessions (Fixed Wage treatment first)	1.055** (0.472)	_
Constant	-1.634*** (0.466)	- 0.759 (0.896)
Number of observations	375	177
Log Likelihood	-154.702	-62.753
Wald χ^2	56.51	29.86
Prob > χ^2	0.0000	0.0000

Note: Standard deviations in parentheses. *** significant at the 0.01 level; ** at the 0.05 level; * at the 0.1 level. We only consider the observations on accepted contracts from the Menu Treatment. We included individual variables (gender, school, experience) in the regressions but as none of them turned out to be significant, they are omitted.

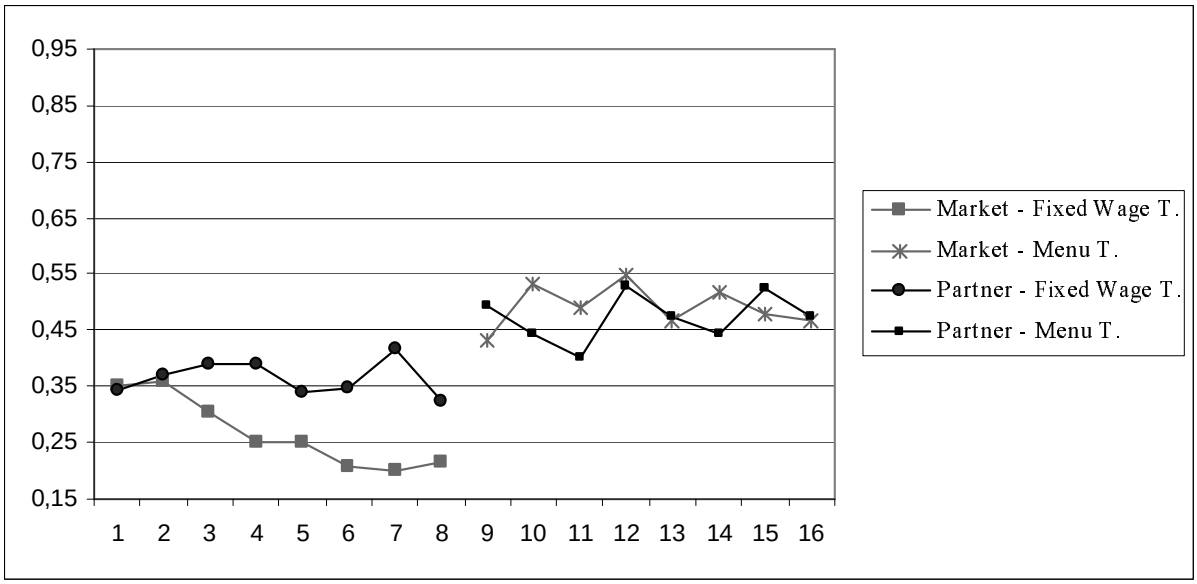

Figure 1. Evolution of average individual effort over time by treatment and condition

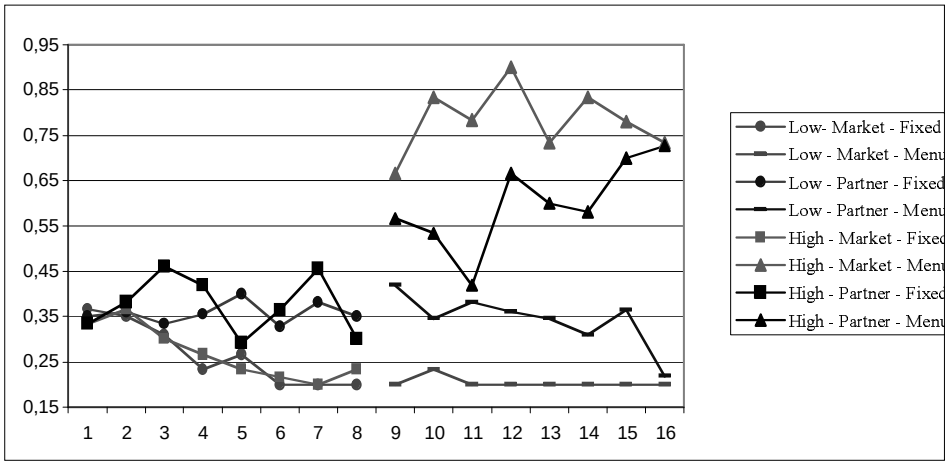

Figure 2. Evolution of average individual effort by skill, treatment and condition

Appendix. Instructions for the Fixed Wage Treatment and the Menu Treatment in the posted bid market condition[9]

You are about to partake in an experiment on decision-making organized for the CNRS (Centre National de la Recherche Scientifique) and the Aarhus School of Business in Denmark. During this session, you can earn money. The amount of your earnings depends not only on your decisions, but also on the decisions of the other participants you will interact with. During the session, your earnings will be calculated in points,

with 100 points = 4 Euros

At the end of the session, all the profits you have made in each period will be added up and converted into Euros. In addition, you will receive a show-up fee of 4 Euros. Your earnings will be paid to you in cash in a separate room in order to preserve confidentiality.

During this session, 8 buyers interact with 8 sellers. There are two categories of sellers (4 X sellers and 4 Y sellers), characterized by different costs. You will be assigned one of these roles (either as a buyer, as a X seller, or as a Y seller) at random at the beginning of the experiment. You will keep the same role throughout the session. You will never be informed of the identity of the participants you will interact with.

The session consists of two parts. The instructions for the second part will be distributed at the end of the first one.

The decision-making in each period of the first part

The first part consists of 8 periods. During each period, a good is traded on the market. Each period consists of two stages.

In the first stage, each buyer has to make an offer for trading one unit of the good. The offer consists of both:

- the price he accepts to pay immediately for buying one unit of the good among four possible prices (20, 25, 35 and 45), and
- the desired level of quality for this good among five possible qualities (0.2, 0.4, 0.6, 0.8, and 1).

A buyer can make only one offer and he can buy only one unit of the good in each period.

Once all the buyers have determined their offers, the 8 offers are displayed at the same time on the sellers' screens. Each seller will then one by one be able to choose one and only one offer, when invited to proceed by the appearance of a green mark on his screen. The order in which each seller can choose an offer among the remaining offers is random. As soon as an offer has been accepted, it is removed from the screens of the sellers. A seller can decide not to accept any offer.

As soon as a buyer's offer has been accepted, this buyer pays the price to his seller and they proceed immediately to the second stage.

In the second stage, once he has been paid the price by the buyer, it is up to the seller to choose the quality of the good he actually delivers to this buyer, among the values: 0.2, 0.4, 0.6, 0.8, and 1.

Each buyer is then informed on the acceptance of his offer, on the type, X or Y, of his seller, on the actual quality of the good and on his payoff for the current period. The seller is also informed about his payoff.

Then a new period starts automatically. New offers are made. The order of presentation of these offers is randomly determined, so that, for example, the first offer which is displayed on the screen does not always come from the same buyer. The probability to interact with the same participant in two consecutive periods is thus low.

[9] The other set of instructions is available upon request to the authors.

How are the payoffs in each period determined?

The seller's payoff

If the seller has not accepted any offer, his payoff is zero for the period.

If the seller has accepted an offer, he must subtract two costs from the price he received:

- a production cost, amounting to 8 points
- a quality cost associated with the level of quality he has chosen according to the table below

Quality levels	0.2	0.4	0.6	0.8	1
Quality costs for the X sellers	2	6	12	20	30
Quality costs for the Y sellers	1	3	5	8	12

The higher is the number chosen by the seller, the higher is the level of quality. The higher the quality level, the higher the cost to the seller.

The seller's payoff in points is thus determined by the computer by the following formula:

Seller's payoff = Price paid by the buyer

– Production cost (=8)

– Cost of the quality chosen by the seller

The buyer's payoff

If the buyer's offer has not been accepted, his payoff is zero for the period.

If his offer has been accepted, the buyer gets a certain amount of points (reselling price) from the experimentalist for the good he bought. This reselling price is 100 points.

From this reselling price, the buyer must subtract the price paid to the seller. To determine the buyer's payoff, this amount is then multiplied by the quality level actually chosen by the seller.

The buyer's payoff in points is thus determined by the computer by the following formula:

Buyer's payoff = (Reselling price – Price paid to the seller)

x Quality chosen by the seller

On the other form which has been distributed, Table A displays all the payoffs in points associated with all possible decisions. Rows represent the various possible prices. Columns represent the various possible actual quality levels.

Within each cell at the crossing of one price and one actual quality, you can observe three values. The upper category (blue) corresponds to the X seller's payoff. The medium category (yellow) corresponds to the Y seller's payoff. The last category (pink) indicates the buyer's payoff.

These payoffs are **net payoffs**, after deduction of the production and quality costs for the seller and after taking the reselling price into account and after deduction of the price for the buyer.

Further information
Before starting the session, we will ask you to answer some questions about these instructions. As soon as you have answered these questions correctly, you will been kindly requested to enter personal information about your gender, your age, your school, your level and field of studies, your situation in the labor market, and whether you already earlier participated in an experiment. These pieces of information will remain confidential. Then, the experiment will start.

If you have any questions regarding these instructions, please raise your hand; your question will be answered in private. Throughout the entire session, talking is not allowed. Any violation of this rule will result in being excluded from the session and not receiving payment.

Thank you for your participation.

Table A. Net payoffs of the buyers and the sellers

Actual quality Price chosen by the paid by the seller buyer	0.2	0.4	0.6	0.8	1	Net Payoff
20	10	6	0	- 8	- 18	X seller
	11	9	7	4	0	Y seller
	16	32	48	64	80	Buyer
25	15	11	5	- 3	- 13	X seller
	16	14	12	9	5	Y seller
	15	30	45	60	75	Buyer
35	25	21	15	7	- 3	X seller
	26	24	22	19	15	Y seller
	13	26	39	52	65	Buyer
45	35	31	25	17	7	X seller
	36	34	32	29	25	Y seller
	11	22	33	44	55	Buyer

Reminder: the buyer chooses a price and a desired quality; then the seller chooses the actual quality

Within each cell at the crossing of one price and one actual quality, you can observe three values. The upper category (blue) corresponds to the X seller's payoff. The medium category (yellow) corresponds to the Y seller's payoff. The last category (pink) indicates the buyer's payoff.

These payoffs are **net payoffs**, after deduction of the production and quality costs for the seller and after taking the reselling price into account and after deduction of the price for the buyer.

Instructions for the second part

This second part consists also of 8 periods.

What is new compared to the first Part?

First stage

Each buyer has to make an offer that from now on consists of two possible modes of payment in exchange for one unit of the good, the Mode of Payment A and the Mode of Payment B. If this offer is accepted by a seller, this later will opt for one of these two modes.

- Within the "Mode of Payment A": the buyer chooses
  - the price he accepts to pay immediately for buying one unit of the good among four possible prices (20, 25, 35 and 45) and
  - the desired level of quality for this good among five possible qualities (0.2, 0.4, 0.6, 0.8, and 1).

  This price is paid as soon as a seller has accepted the offer and chosen this mode of payment. This mode of payment corresponds to the conditions in use in the first part of the session.
- Within the "Mode of Payment B": the price which will apply is determined by a price schedule depending on the actual quality chosen by the seller who will have accepted the offer and this mode of payment, as indicated in the table below. Each price is here equal to:

  (50 times the corresponding quality level) - 5

  with a minimum price of 20 and a maximum price of 45. Under this Mode, the price is thus paid after the seller has chosen the actual quality level of the good. This price schedule is the same for all the buyers.

Mode of Payment B

Quality chosen by the seller	0.2	0.4	0.6	0.8	1
Price paid by the buyer after the choice of the quality by the seller	20	20	25	35	45

This table should be read as follows: for example, if the seller chooses the quality 0.2, then the buyer will pay the price 20; if the seller chooses the quality 0.6, the buyer will pay the price 25; and so on.

Once the buyers have determined their offers within the two Modes of payment, the 8 offers are displayed on the sellers' screens at the same time. Each seller will then one by one be able to choose one offer.

As soon as he has accepted a buyer's offer, the seller chooses one of the two Modes of Payment proposed by this buyer, either Mode A or Mode B, and both proceed immediately to the second stage.

Second stage

- If the seller has accepted the offer of a buyer and chosen the Mode of Payment A: after having been paid the price by the buyer, the seller chooses the quality of the good that he delivers to the buyer among the values: 0.2, 0.4, 0.6, 0.8 or 1.
- If the seller has accepted the offer of a buyer and chosen the Mode of Payment B: the seller chooses the quality of the good that he delivers to the buyer and then, the price is paid by the buyer according to the price schedule.

All the other conditions in use in the first part continue to apply. The information feedback is the same as in the first part but in addition, the buyer is informed about the choice of the Mode of payment by his seller. The payoffs are determined in the same way as in the first part of the session.

Reminder: the seller's payoff in points is given by the following formula:

Seller's payoff =	Price paid by the buyer – Production cost (=8) – Cost of the quality chosen by the seller

Reminder: the buyer's payoff in points is given by the following formula:

Buyer's payoff =	(Reselling price – Price paid to the seller) x Quality chosen by the seller

The difference relative to the first part is that the price is determined according either to the Mode of Payment A or to the Mode of payment B, as chosen by the seller.

The attached sheet of paper presents two tables displaying all the payoffs in points associated with all possible decisions under each mode of payment. Table A is the same as the one used in the first part and corresponds to Mode of Payment A. Table B corresponds to Mode of Payment B. These payoffs are still net payoffs.

You are not allowed to ask questions about this set of instructions. So please read them carefully and fill out the attached questionnaire. After your answers have been checked, we will restart the session.

Net payoffs of the buyers and the sellers

Table A. Mode of Payment A

Actual Quality / Price	0.2	0.4	0.6	0.8	1	Net Payoffs
20	10	6	0	- 8	- 18	X seller
	11	9	7	4	0	Y seller
	16	32	48	64	80	Buyer
25	15	11	5	- 3	- 13	X seller
	16	14	12	9	5	Y seller
	15	30	45	60	75	Buyer
35	25	21	15	7	- 3	X seller
	26	24	22	19	15	Y seller
	13	26	39	52	65	Buyer
45	35	31	25	17	7	X seller
	36	34	32	29	25	Y seller
	11	22	33	44	55	Buyer

Table B. Mode of Payment B

Actual Quality	0.2	0.4	0.6	0.8	1
Prix	20	20	25	35	45
X seller's net payoff	10	6	5	7	7
Y seller's net payoff	11	9	12	19	25
Buyer's net payoff	16	32	45	52	55

Mode A: the buyer chooses a price and a desired quality
Then the seller chooses the actual quality.

Mode B: the seller chooses an actual quality
Then the corresponding price applies according to the price schedule.

In each cell at the crossing of a price and a quality, the upper category (blue) corresponds to the X seller's payoff. The medium category (yellow) corresponds to the Y seller's payoff and the third category (pink) indicates the buyer's payoff.
These payoffs are **net** payoffs, after deduction of the production and quality costs for the seller and after taking the reselling price into account and after deduction of the price for the buyer.